

Innovation for the next generation



ML7008F-LFT

224G/Lane BERT | 16 Transmitters | 8 Receivers | 40dB Equalization | PAM4 & NRZ | CEI-224G-LR compliant | IEEE P802.3dj Compliant | 14 Tx FFE Taps | Rx Equalizer

Summary

At 1.6T, the need for hyper-scalable, high-value comprehensive testing is more important than ever. From validating fiber optic and copper wire digital data transmission lines to testing transceiver signal integrity, Bit Error Rate Testers (BERT) are essential to ensuring smooth operation of the devices at the heart of data centers around the world.

The ML7008F-LFT is a 224G/Lane, 16-channel Tx and 8-Channel Rx BERT, designed to meet the most stringent testing requirements of the Terabit generation. The ML7008F-LFT is equipped with Real-Hardware FEC and a leading SerDes ASIC chip with over 40dB of equalization. The ML7008F-LFT's capabilities enable comprehensive testing of linear pluggables, including Linear Pluggable Optics, Linear Receive Optics, Active Copper Cables, Passive DACs.

The ML7008F-LFT is available as either a standalone instrument or as the MW7008F-LFT, a module in the MultiWave Test Platform (MWTP). When fitted into the MWTP, two MW7008F-LFTs can work in concert, allowing for full bi-directional 1.6T traffic testing of two optics from different vendors, or full AEC/ACC/DAC validation.

ML7008F-LFT

16 x 224G transmitters and 8x 224G Receivers BERT

Introduction

The ML7008F-LFT is a fully-featured BERT that can be configured as 16 transmitters and 8 receivers of 224G, 116G and 56G PAM4 and 106.25G NRZ and their derivative dynamic rates.

The ML7008F-LFT is compliant with the IEEE P802.3dj, and OIF CEI 112G LR.

The transmitters support all standard test patterns mandated by the specs such as PRBS13Q, PRBS31Q, etc. while the advanced transmitters support SSPRQ.

The ML7008F-LFT supports transmitter and receiver equalization up to 40dB to overcome signal integrity impairments due to channel losses or reflections.

The ML7008F-LFT is available as a standalone instrument or as a module in the MultiWave Test Platform (MWTP), the MW7008F-LFT.

When fitted in the MWTP, two MW7008F-LFTs enable users to perform bi-directional traffic testing of transceivers from different vendors and of Active Copper Cables, Active Electrical Cables, and Direct Attach Copper.

Key Features

Transmit

- Data Rates: up to 232Gbps/116Gbaud (backward compatible with 800G and 400G).
- Fixed Rates: 26.5625, 53.125, 106.25(PAM4).
- Supported rates:
 - 26→29(PAM4)
 - 49→58(PAM4)
 - 97→116(PAM4)
- Ability to tune the bit rate in steps of 100kbps and find the Rx PLL locking margin.
- Independent control of inner eye levels.
- Supports Gray coding in rate 53 Gbaud.
- 6 or 3-tap pre- and post-emphasis linear FFE.
- Independent PLL per Lane.
- Link Training for automatic optimal Tx Taps equalization for optimal BER.
- Real hardware pre- and post-FEC on 100G, 400G, 800G blocks.
- Available patterns:
 1. In PAM4:
 - PRBS_9_4/_11/_13Q/_15Q/_23/_31 Q/_58
 - SQ16
 2. In NRZ:
 - RBS_9_4/_11/_13/_15/_23/_31/_58
 - SQ16
- Pre coder Feature.

High Drive Transmitters (DTx)

- Data Rates: up to 116 Gbaud (backward compatible with 800G and 400G).
- Fixed Rates: 26.5625, 53.125, 106.25(PAM4) 106.25(NRZ).
- Supported rates:
 - 26→ 29(PAM4)
 - 49→ 58(PAM4)
 - 97→ 116(PAM4)
- Ability to tune the bit rate in steps of 100kbps and find the Rx PLL locking margin.
- Independent control of inner eye levels.
- Supports Gray coding at rate 53 Gbaud.
- 3/6/10 taps pre- and post-emphasis linear FFE.
- Available patterns:
 1. In PAM4:
 - PRBS_9_4/_11/_13Q/_15Q/_23/_31Q/_58/SSRPQ
 - SQ16
 2. In NRZ:
 - PRBS_9_4/_11/_13/_15/_23/_31/_58/SSRPQ
 - SQ16

Receive

- SNR monitoring over time.
- Independent CDR on each lane.
- Independent PLL per lane.
- PAM histogram monitor.
- Error-detection on following patterns:
 - RBS_9_4/_11/_13Q/_15Q/_23/_31Q/58
 - Auto Detect
- LOS indicators.
- Up to 40dB equalization.
- Block Error Ratio (BLER Measurements).
- Extended Reach Feature.
- Pre coder Feature.

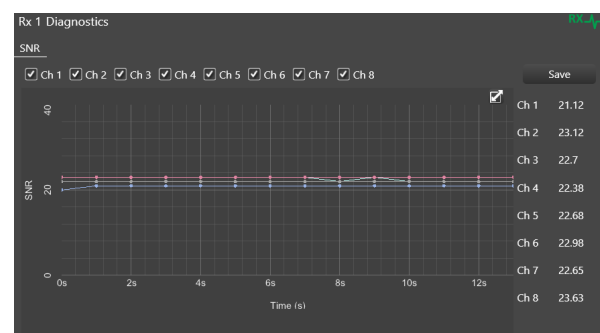


Figure 1: PAM4 Histogram

Target Applications

- General Purpose 224G/Lane tester.
- Pluggable and Linear Pluggable Optics.
- Testing of copper and fiber-optic transmission lines.
- Active and Passive Cables Testing.

General

- LabView driver and Python wrapper available.
- API libraries with documentation.
- Compatible with ThunderBERT Interface.
- Compatible with Lane Control for IP Changing, FW Update and DHCP.

Using ThunderBERT, instant and accumulated BER, FEC, and SER measurements can be displayed and monitored:

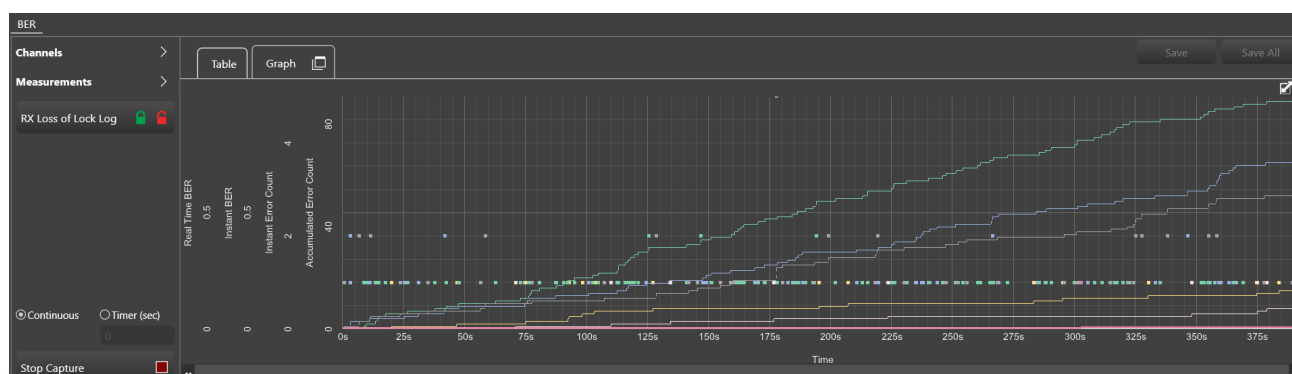


Figure 2: ThunderBERT 2 GUI Screenshots Showing BER Measurements

Specifications

Parameter		Specifications
Bit Rates		Up to 116 Gbaud and backward compatible with 800G and 400G: Up to 113Gbaud on the Advanced Tx Side
Tx Amplitude Differential		Up to 700mV Differential Peak-to-peak voltage
Tx Supported Patterns		PRBS_9-4/_11/_13Q/_15Q/_23/_31Q/58
High Drive Tx (DTx) Amplitude		Differential Drive: controllable from 0Vpp to 2.6Vpp-diff
		Up to 1.3Vpp-SE
High Drive Tx (DTx) Supported Patterns		PRBS_9-4/_11/_13Q/_15Q/_23/_31Q/58 & SSRPQ
Rx Supported Patterns		PRBS_9-4/_11/_13Q/_15Q/_23/_31Q/58
Rx Supported Amplitude		Up to 800mV
Random Jitter RMS ¹		< 300 fs
Rise/ Fall Time (20–80%) ¹		TBD
Coding		Gray coding supported on HTx and DTx at rate 53Gbaud
Output Return Loss up to 10 GHz		TBD
Output Return Loss (16-25 GHz)		TBD
Error Detector Input Range		100mVpp-diff to 800mVpp-diff
Tx/Rx Connectors		1x 16 SMPS Connector
Reference Clock Output	Reference Clock	312.5 MHz and 625MHz
	High Frequency Clock	A multiplier from 1 to 14 of the reference clock
Diff. Input Return Loss		Better than 10 dB
Eye Monitor Resolution		8 bits horizontal across 2 UI / 9 bits vertical
Clock Input Range		Up to 350 Mhz
Clock Input Amplitude		800 – 1600 mV
Input Impedance		50 Ω
Ambient Temperature		0 – 75 °C
Power		External Power Supply 110 V, 1.4 A or 220 V, 0.9 A – 50/60 Hz

¹ With appropriate pre and post emphasis settings and 70 GHz scope. Trigger from adjacent data channel rate/64

Mechanical Dimensions

Up to 2 MW7008F-LFT modules can be fitted in a single MWTP chassis.

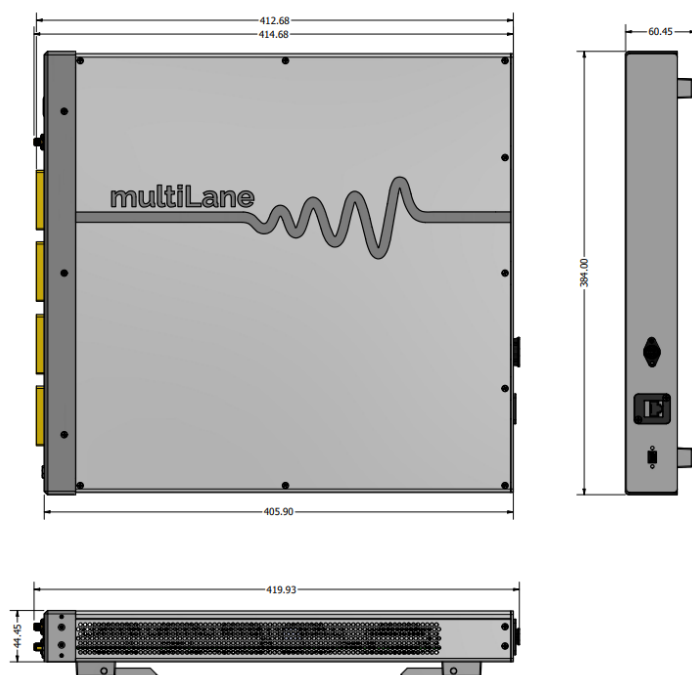


Figure 3: MWTP Outline

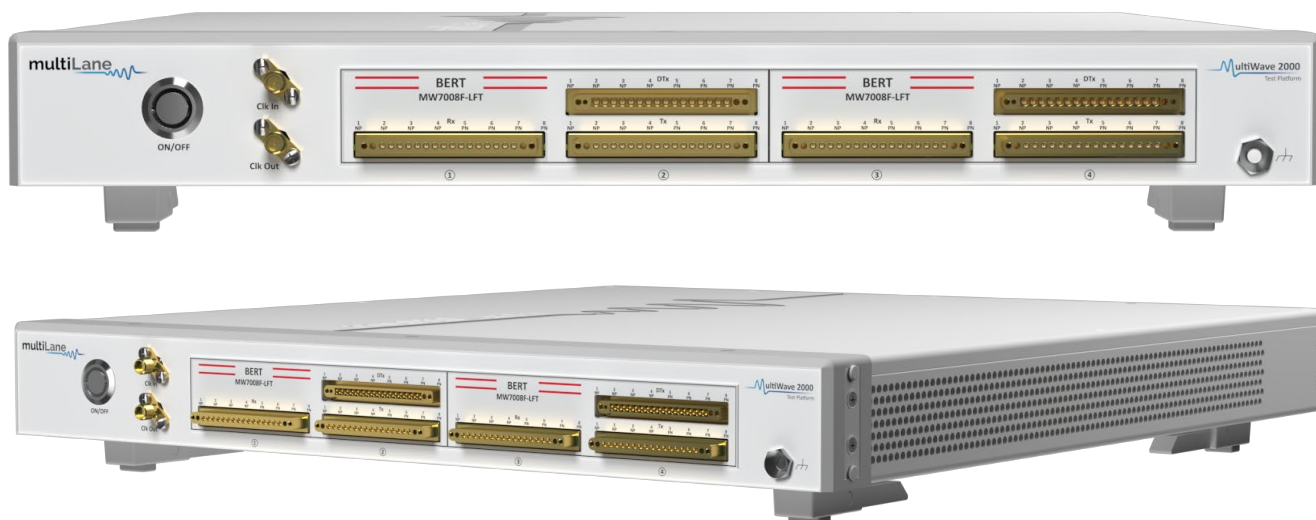


Figure 4: 2x MW7008F-LFT in the MWTP

Ordering Information

Option	Description
ML7008F-LFT	224G/Lane BERT 8 Channels
FEC	Real Hardware FEC Analysis
3YW	Total 3-year warranty
CAL	Single calibration
3YWC	Total 3-year warranty with 3 annual calibrations

Recommended Accessories

Part Number	Description
MLCC-SMPSBFC116-F047075-185MST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (M), Flexible 047, 7.5 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F04715-185MST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (M), Flexible 047, 15 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F04730-185MST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (M), Flexible 047, 30 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F04760-185MST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (M), Flexible 047, 60 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F047075-185MST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (M), Flexible 047, 7.5 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F04725-SMPSBFC116	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1X16 SMPS Blind-Mate (F), Flexible 047, 25 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F047075-185FST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (F), Flexible 047, 7.5 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F04715-185FST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (F), Flexible 047, 15 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F04730-185FST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (F), Flexible 047, 30 cm, phase matched to +/-0.5 ps.
MLCC-SMPSBFC116-F04760-185FST	Coax Cable Assembly, 1X16 SMPS Blind-Mate (F) to 1.85 mm (F), Flexible 047, 60 cm, phase matched to +/-0.5 ps.

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